

REMARKS

Applicant has amended the specification and the claims to more clearly call for the first riser section to be adapted to selectively catalytically crack a hydrocarbon feedstock to gasoline, and for the second riser section to be adapted for selectively cracking the gasoline produced in the first riser section to olefins. Support for the amendments can be found on page 5, lines 6-8, and page 6, lines 8-12, of the originally filed specification. No new matter has been added.

Applicant also amended the specification and claims to correct other minor errors. No new matter has been added. Applicant also responds as follows:

1-2. In points 1 and 2 of the Office Action, the Examiner acknowledged Applicant's election of Group I, Claims 1-10, in Paper No. 5. Accordingly, Claims 11 through 19 are withdrawn without prejudice to their assertion in a timely filed divisional application.

3. In point 3 of the Office Action, the Examiner objected to the disclosure as containing informalities on page 8, line 3. In accordance with the Examiner's request for correction, the phrase "first diameter transition zone 22" on page 8, line 3, has been changed to the "first diameter transition zone 20" as set forth on page 6, line 17. No new matter has been added by this amendment.

4. In point 4 of the Office Action, the Examiner objected to FIG. 1 because "it is unclear as to which angle the 'first diameter transition zone 20' and the 'second diameter transition zone 25' is intended by reference characters 22 and 27 respectively." In response, Applicant submits a corrected FIG. 1 that further delineates the angles

intended by reference characters 22 and 27. No new matter has been added by this amendment.

5. In point 5 of the Office Action, the Examiner requested Applicant's cooperation in correcting any errors of which Applicant may become aware. Applicant will cooperate to correct such errors.

6. In point 6 of the Office Action, the Examiner objected to Claim 1 as containing an informality in line 13. In accordance with the Examiner's requirement, the term "separator" has been inserted before "means for separating" in line 13. No new matter has been added by this amendment. Reconsideration is respectfully requested concerning the objections in points 3-6 based on the amendments.

7. In point 7 of the Office Action, the Examiner rejected Claims 1 through 10, under 35 U.S.C. §112, second paragraph, as being indefinite. The Examiner rejected Claim 1 based on the use of the terms "narrower" and "wider" with regard to the first and second riser sections. In response, the specification, Claim 1 and all subsequent uses of the terms have been deleted and amendments were made to identify the components more particularly. No new matter has been added.

The Examiner stated that it is unclear as to which reference angle is intended by the use of the term "angle" in Claims 3, 4 and 6. In response, the specification and Claims 3, 4 and 6 have been amended to make clearer the angles referenced. No new matter has been added.

The Examiner stated that Claims 9 and 10 lack proper positive antecedent basis. Accordingly, Claims 9 and 10 have been amended in response to this rejection. No new

matter has been added. Reconsideration is respectfully requested concerning the rejections in point 7 based on the amendments.

8. In point 8 of the Office Action, the Examiner rejected Claims 1 through 6 and 8 through 10, under 35 U.S.C. § 102(b), as being anticipated by Xu *et al.* (EP 1 046 696) (the “Xu reference”). Applicant respectfully traverses the rejection.

Applicant respectfully submits that the Xu reference is markedly different from the present claimed invention. For example, the second reaction zone (c) of the Xu reference serves as a reaction environment for the isomerization of the hydrocarbon feedstock that has been processed in the first reaction zone (b). According to the Xu reference, “the preheated feedstock is contacted with hot regenerated catalyst in the lower part of a reactor [first reaction zone b] with the result that catalytic cracking reaction takes place, and the mixtures of vapors and the coke deposited catalyst are up-flowed and enter into a suitable reaction environment with the result that **isomerization** and hydrogen transfer take place.” Abstract (emphasis added). Further, the Xu reference provides that the isomerization process be conducted at a reaction temperature that is lower than the temperature required for a cracking reaction. See Xu reference at Tables 3, 5, 6, 8, 9 and 11.

In marked contrast, the second riser cracking section (4) of the present claims is a **catalytic cracking** section for selectively cracking the gasoline produced in the first riser cracking section (2) to olefins as product. In addition, because the function of the second riser section is cracking, higher temperatures than those necessary for isomerization are required. In this regard, Applicant further notes that the Xu reference also refers to a quench 6, between the first reaction zone (c) and second reaction zone (b), the ostensible

purpose of which is to reduce the temperature of the feedstock upon entry to the second reaction zone. Such cooling teaches away from the present invention, which requires high temperatures in both riser sections to accomplish dual cracking.

The references are also different in their purpose. The stated purpose of the Xu reference is the production of isobutene and isoparaffin-enriched gasoline. The objectives of the present claimed invention is to provide an apparatus for the selective production of olefins such as ethylene, propylene, the butenes and the pentenes that are useful in preparing a wide variety of end petrochemical products, including but not limited to polyethylenes, polypropylenes, polyisobutylene and other polymers, alcohols, vinyl chloride monomer, acrylonitrile, methyl tertiary butyl ether and other petrochemicals, and a variety of rubbers such as butyl rubber.

Applicant also notes that Claim 1 has been amended to make clearer that the present claimed invention calls for an apparatus having two cracking reaction zones (as opposed to a cracking zone followed by an isomerization zone) to produce olefins (as opposed to isomers of butane).

The Xu reference also differs from the present invention in that the structure of the outlet zone (d) is similar to that of a conventional iso-diameter riser [0026] and, of course, is a conduit for isobutene and isoparaffin-enriched gasoline. In contrast, the riser product conduit of the present invention need not be so constructed and, of course, is a conduit for olefins such as ethylene, propylene, the butenes and the pentanes.

As fully explained above, the Xu reference does not anticipate the present invention. Accordingly, any ranges for the transition angle between the first reaction zone (b) and the isomerizer (c) are irrelevant to the claimed ranges for the first and second riser

sections of the present invention. Finally, given the differences between the isomerizer (c) and outlet zone (d) of the Xu reference, on the one hand, and the second cracking riser section and product conduit of the present invention, on the other hand, the angles related to the former are irrelevant to the latter and vice versa.

Based on the foregoing, it is respectfully submitted that the Xu reference does not anticipate independent Claim 1 and dependent Claims 2 through 6 and 8 through 10 as the Examiner initially indicated. Reconsideration is respectfully requested.

9. In point 9 of the Office Action, the Examiner rejected Claims 1 through 6 and 8 through 10, under 35 U.S.C. § 102(b), as being anticipated by Weinberg *et al.* (U.S. 5,196,172) (the “Weinberg reference”).

The Examiner stated that Weinberg discloses:

- a first narrower riser reactor section (i.e., lift section 3) having a radius x, and a means for feeding hydrocarbon feedstock (i.e., feed nozzles 4) and for feeding cracking catalyst (i.e., via lines 2, 6) located in the lower portion thereof
- second wider riser reactor section (i.e., comprising vaporization zone 5 and reaction zone 8) having a radius y wherein the ratio of y:x appears by illustration to range from about 1.1:1 to 5.0:1, or about 1.25:1 to 2.5:1 (since the diameter of zones 5, 8 is greater than the diameter of section 3) operatively connected to said first narrower riser reactor section (3) by a first diameter transition section (i.e. comprising feed injection point 4a)

As a preliminary matter, the Weinberg reference is distinguishable from the present invention because it does not involve two cracking zones or the dual cracking of the present invention. Instead, the hydrocarbon feedstock is cracked only in the riser (8) before it enters the stripper (12).

With respect the Examiner’s specific comments, Applicant notes that the lift section (3) of the Weinberg reference is different from the first narrower riser reactor section (2)

of the present invention in which cracking occurs. The lift section (3) of the Weinberg reference cannot serve as a cracking zone for catalytically cracking a hydrocarbon feedstock because there is no catalyst or hydrocarbon feedstock present in the lift section (3) of Weinberg. The lift section contains only a mixture of sorbent (via transfer line (2)) and lift gas (3a). Col. 9, lines 55. “Hydrocarbon feed, steam and water and other possible dilutants are injected into the riser [8] through feed nozzles (4) at the feed injection point (4a)” which is at the base of the riser (8). Cracking of the feedstock occurs in the riser (8) reaction zone. *See* Col. 10, lines 1-3 (emphasis added). Catalyst is not added until section 5 via inlet 6. Thus, the lift section (3) cannot be construed as a cracking section.

Equally important, the vaporization zone/reaction zone that comprise the riser (8) of the Weinberg reference is different from the second riser section (4) of the present invention. The riser of the Weinberg reference receives hydrocarbon feedstock. In contrast, the second riser section of the present invention does not receive hydrocarbon feedstock but instead receives hydrocarbon feedstock that has been cracked in the first riser reactor section.

Based on the foregoing, it is respectfully submitted that the Weinberg reference cannot anticipate independent Claim 1 and dependent Claims 2 through 6 and 8 through 10 as the Examiner initially indicated. Reconsideration is respectfully requested.

10. In point 10 of the Office Action, the Examiner rejected Claim 7, under 35 U.S.C. § 103(a), as being unpatentable over the Xu reference in view of Goelzer *et al.* (U.S. 5,087,349) (the “Goelzer reference”). According to the Examiner, the Xu reference teaches the elements of Claim 7 except that the riser product conduit further comprises a

quench injection means. The Examiner asserts that the Goelzer reference teaches the distribution of quenching means along the length of a catalytic cracking riser.

However, as explained above, the Xu reference does not teach the invention of the Claim 1 from which Claim 7 depends. Further, the Goelzer reference does not cure the deficiencies of the Xu reference. Further, there is no objective teaching in the references that would support combining the references. *In re Fritch*, 972 F.2d 1260, 23 U.S.P.Q.2d 1780 (Fed. Cir. 1992) (references may only be combined where there is some objective teaching in the prior art would lead one of ordinary skill in the art to combine the relevant teachings of the references); *In re Gorman*, 933 F.2d 982, 18 U.S.P.Q.2d 1885 (Fed. Cir. 1991) (it is impermissible to use the claimed invention as a template or instructional manual to piece together the teachings of the prior art so that the claimed invention is rendered obvious).

Moreover, given the numerous differences between the Xu reference and the present invention, the Xu reference teaches away from the present invention. That is, one skilled in the art following Xu would clearly be led in a direction divergent from the path taken by the Applicant. *In re: Gurley*, 31 U.S.P.Q.2d 1130 (Fed. Cir. 1994). As the Examiner is aware, combining references is especially inappropriate where the prior art teaches away from the invention under consideration. *Ecolochem, Inc. v. Southern California Edison*, 227 F.3d 1361 (Fed. Cir. 2000).

Based on the foregoing, Applicant respectfully requests reconsideration and removal of this rejection.

11. In point 11 of the Office Action, the Examiner rejected Claims 1 through 6 and 8 through 10, under 35 U.S.C. 103(a), as being unpatentable over the Weinberg

reference. According to the Examiner, although “Weinberg et al. appear to disclose by illustration a ratio of y:x from about 1.1:1 to 5.0:1 or about 1.25:1 to 2.5:1, and a riser product conduit having a radius of approximately x, Weinberg et al. are silent as to explicitly disclosing recited ranges.” However, according to the Examiner, discovering the ranges of Claims 1, 2, 5 and 8 involves only routine skill in the art.

The Examiner also rejected claims 3, 4 and 6 as unpatentable in view of the Weinberg reference. According to the Examiner, the Weinberg reference teaches the desirability of angles at the transition between the lift and the riser and discovering the ranges claimed for said angles involves only routine skill in the art.

As fully explained above, the Weinberg reference discloses a lift section (3) and a riser (8) that are both different in function and purpose from the first riser cracking section and the second riser cracking section of the present claimed invention and, therefore, any ratios for the lift section and riser are irrelevant to the claimed ranges for the sections of the present invention. Accordingly, the Weinberg reference could not provide one skilled in the art with the necessary motivation to experiment to discover the ranges claimed. For the same reason, any ranges for the transition angle between the lift section and riser are irrelevant to the claimed angle ranges concerning the sections of the present invention.

Based on the foregoing, Applicant respectfully requests reconsideration and removal of this rejection.

12. Applicant notes that, in point 12 of the Office Action, the Examiner made of record, but did not rely upon, the Gartside and Herbst references to show the general state of the art.

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It is respectfully submitted that claims 1 through 10 are in condition for allowance. Early and favorable action is earnestly solicited.

Respectfully submitted,



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